Attorney Docket No. 45888-1

IN THE UNITED STATES
PATENT AND TRADEMARK OFFICE

Application No.	: 09/895,334
Applicant	: Rejean AUBE
Filed	: July 2, 2001
For	: DELAY COMPOSITIONS AND DETONATION DELAY DEVICES UTILIZING SAME
Group Art Unit	: 3641
Examiner	: A. Felton

DECLARATION UNDER 37 C.F.R. § 1.132

I, Rejean AUBE, declare that:

1. I am the sole applicant named in the above-identified application, and I am the sole inventor of the invention described and claimed therein.

2. Details of my education, training and experience are provided in attached Exhibit A.

3. I have reviewed U.S. patent No. 4,419,154 to Davitt et al. and U.S. patent 3,291,664 to Taylor, as well as the comments made by the Examiner in the official action of September 15, 2006. In particular, I note the Examiner's comment on page 2 that:

> It would have been obvious to one having ordinary skill in the art at the time the invention was made to use less red lead to result in a lower burning rate. Since Davitt teaches that the inclusion of red lead would speed up the burning rate, it would conversely decrease if less red lead were used.

I disagree with this assessment. It was known at the time that the present invention was made that red lead is a strong oxidizer and therefore a burning rate accelerant. Bearing in mind that the objective of the present invention was to make a delay composition, i.e. a composition that does not burn quickly or instantly, red lead would not logically occur to

a person of ordinary skill in the art as a material to use in such compositions. While it might occur to the person of ordinary skill that the use of lesser amounts of red lead would produce less of an accelerating effect on the burning rate, it would also be logical to assume that amounts small enough not to produce any significant increase of the burning rate would also not have any other significant effects, e.g. on the stabilization of combustion. A surprising finding of the present invention is that amounts of red lead that are quite substantial (but still below those suggested by Davitt et al.) do not materially increase the burning rate of the delay composition but nevertheless increase the stabilization of combustion when the composition is used in confinement elements made of rigid metals.

It should be kept in mind that the present invention was made to satisfy the need to find a delay composition that would be effective in confinement elements made of rigid metals, such as zinc. Delay compositions were known for confinement elements made of lead and they functioned well when in contact with that metal, but not with rigid metals.

Prior to the present invention, my employer used a composition known as Composition Y (Y comp) for confinement elements made of lead. This composition consisted primarly of barium sulfate and silicon with no red lead. When this composition was evaluated in rigid zinc elements it was found to fail either during ignition or propagation. The use of red lead to overcome these problems occurred to me, but I initially assumed that it could only be tolerated in very small amounts (to avoid increasing the burn rate significantly) and that this would lead to problems of homogeneity of the mix. If an ingredient (whatever it is) is used in very minimal amounts, it is very difficult to ensure that it is properly and evenly dispersed throughout the composition. The consequence of this, particularly when using a very reactive material like red lead, would be to provide erratic timing data and therefore a high standard deviation for the time delay. However, the experiments that I conducted (and described in the present application) showed that the addition of red lead in amounts from 0 to 15% by weight had a negligible effect on the burn rate of Composition Y when loaded in rigid zinc elements. So, at a proportion of 12% (the preferred amount), it is fairly easy to achieve a good homogeneity with other ingredients and this had no perceptible effect on the burn rate but, on the other hand, produced a powder mix that was found to work quite well in rigid zinc even at temperatures a low as –40°C as opposed to Y comp with no read lead. It is this combination of little effect on the burn rate but significant effects on the stabilization of ignition and propagation in amounts of red lead up to fairly high percentages (but still lower than those suggested by Davitt et al.) that makes the present invention unpredictable from conventional knowledge. Davitt et al. makes no reference to these effects of red lead at lower percentages and a person skilled in the art could not derive them from Davitt et al. Indeed, such a person would likely assume from Davitt et al. that amounts of red lead less than 25% (the minimum used by Davitt et al.) would not be useful for any purpose (or why would Davitt et al. provide such a lower limit?).

3. As shown in the Table below (which is based on the Experimental Test Report ETR 1R-86-142 discussed in and attached to my previous Declaration of June 29, 2006),

the difference for the time delay between 0% and 12% of red lead additions in Y comp was 171 msec, which is well within my employer's specification for the minimum and the maximum acceptable value (2319 msec to 2806 msec = 487 msec) for this delay period using Y comp and 0% red lead. Indeed, even at 15%, the difference is only 403 msec, whereas at 20% the difference has risen to 900 msec, which is well outside the specification. Hence, a speed-up caused by the red lead really starts being apparent (in a rigid zinc element) only when reaching levels above 15% w/w.

Red Lead (% w/w)	Delay time measured
0	2687
3	2800
5	2756
7	2737
9	2725
12	2516
15	2284
20	1787

The Examiner seems to suggest that Davitt et al. implies some kind of linear increasing relationship between burn rate and red lead content, but I found that, at amounts below 15%w/w, additions or red lead do not affect the burn rate (delay time) appreciably. This makes it possible to use higher amounts of red lead and thereby achieve good reliability for ignition and propagation. This is just not apparent from Davitt et al.

4. As for Taylor, which shows the use of an organic binder, it should first of all be said that the presence of carboxymethylcellulose (CMC) in the mixture of the present invention is not essential for the success of the invention and is merely a preferred inventive feature. I have been told that the Examiner's inclusion of this feature with the main features of the invention has been done for procedural reasons and that this feature is not specified in the broad claims of the present application. I therefore do not think that Taylor in any way shows that the present invention, in its broadest form, was known or obvious at the time that the invention was made, whether combined with the teaching of Davitt et al. or not.

Moreover, Taylor relates to a different art from Davitt et al. (primary explosives versus delay compositions, which are not seen as directly equivalent by persons of ordinary skill in the art), so the fact that Taylor et al. uses CMC would not be seen as relevant in the invention of Davitt et al. In fact, there is no need to use CMC in the invention of Davitt et al. CMC is an organic binder used to make hard granules of the delay powder in the present invention. Most of the delay compositions are not free-flowing and therefore it is necessary to add a binder prior to loading the powder into a small bore rigid element having a diameter of, for example, 3.2 mm. This is not necessary for the invention of Davitt et al. which relates to drawn lead elements where (if using conventional techniques) a 14 mm diameter lead tube can be filled with a cohesive powder and further

drawn to the proper small diameter, thus obviating the need for a binder. It is also to be noted that CMC is also hygroscopic, which is detrimental for the long term stability of the nominal timing, so this would discourage its use by Davitt et al. In the present invention, the effect of the CMC as binder used with rigid elements was evaluated to determine the minimal quantity required for proper powder loading.

5. In summary, I do not agree that Davitt et al. (whether or not combined with the teaching of Taylor et al.) in any way makes the present invention obvious or apparent. There would be no reason for a person of ordinary skill in the art to make the powder composition of the present invention without first reading the description of the present application.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

REJEAN AUBE

Date: 25 January 2007

EXHIBIT A

Education, Training and Experience of Declarant Rejean Aube

I obtained a Diploma in Chemical Engineering from Cegep Levis-Lauzon in May 1981 and immediately (the day after the graduation) started working in explosives/pyrotechnics environments at Les Industries Valcartier Inc., Quebec, Canada (Manufacture of ammunition for Military purpose). A few years later (1986), and after having been involved with all manufacturing processes for making primary explosives such as tetracene, lead styphnate, and pyrotechnics such as tracer compositions, I moved from manufacturing to Research and Development and kept being involved in R&D/Technical for pyros and explosives until the present (2007). I simply never stopped dealing with pyrotechnics.

25 Jan 2007

My notable achievements include:

- Development of a lead-free primer composition for small arm ammunition.
- Development of an "extrudable" primer composition.
- Development of a granulated tracer composition for military applications.

In 1988 I was granted an Award of Excellence from Technology Industrial SNC for having successfully assumed the long term replacement of the R&D manager and for having developed the Granulated Tracer composition.

Other achievements include:

- Development of alternative compositions for shocktubes such as low-velocity shocktube (barium peroxide/HNS etc) and an alternative for HMX/alum based composition which is: Aluminum "gold"/Ammonium perchlorate composition for shocktubes.
- Development of an alternative for lead azide as detonator primary charge.

I am a joint inventor named in US patent No. 5,945,627 issued on August 31, 1999. The invention relates to high energy pyrotechnics for explosive detonators comprising compositions which are characterized by being essentially free from molecular primary explosives, and in particular, free from lead azide. I was the researcher principally responsible for this invention.

I have been invited on many occasions to help with solving problems of pyrotechnics & processes related problems on the major Orica manufacturing sites worldwide, such as in Germany, China, Brazil, Chile, India and Canada.

Since 2005 I have been involved in the Development and Implementation in Brazil of the Auto-Granulated pyrotechnics process for all delay compositions.

25th Jan 2007

In 2006, as a consequence from the work done in 2005 (as above described), I was awarded the International Award for the "New Technology of the year".

Some complementary related seminar/courses

1987: Two weeks seminar on Energetic Materials at Washington College in Maryland.

1993: Advanced seminar on Pyrotechnics at Washington College in Maryland.

1996: Assist the one week 22nd International pyrotechnics Seminar at Fort Collins, Colorado.

2006: Completion of MBA program at Universidade de Taubate, Sao Paulo state, Brazil (highest average score of my promotion).